

occurring. Further, by using strips of lenses cut out at suitable distances from the axes (fig. 3), images of various colours can be placed side by side upon P, since a slit may be placed in the spectrum opposite each such strip of lens. Incidentally, I may mention that investigations into the cause of the variable nature of different flames can be carried out by this plan.

For solar work, a long collimator appears to be a necessity, but the aperture need not be large. Suppose we determine to have an image of the sun on P (fig. 2) of 2 in. diameter, the image on M need not be more than 1 in. at most. For this purpose we must have a collimator 10 ft. long. Two lenses of this focal length can be fixed one at each end, and a slit in front of that lens which is presented to the sun's rays. The arrangements followed will be the same as those given for the electric light. There appears no difficulty in producing a monochromatic image of almost any size if the collimator be sufficiently long and the face of the prism sufficiently large to take in the whole of the image cast on it.*

I have replaced the prism by flat refraction gratings with most satisfactory results. The gratings I employed had about 6,000 and 12,000 lines to the inch. The images were sharply defined, but, of course, weaker than when the prism was employed. For solar work this should not be an objection, since there is plenty of light to work with.

I show some pictures taken by the plan I have described. For my purpose the images are sufficiently sharp, although simple uncorrected lenses have been employed.

“On the Determination of the Photometric Intensity of the Coronal Light during the Solar Eclipse of 16th April, 1893.” By Captain W. DE W. ABNEY, C.B., D.C.L., F.R.S., and T. E. THORPE, LL.D., F.R.S. Received April 14,—
Read April 30, 1896.

(Abstract.)

In this paper the authors give the results of the measurements of the intensity of the light of the corona, as observed at Fundium in Senegal, on the occasion of the solar eclipse of April 16th, 1893. The methods employed by them were practically identical with those used at Grenada, in the West Indies, during the eclipse of 1886, an account of which is given in the ‘Phil. Trans.,’ A, 1889,

* It should be mentioned that to minimise diffraction the slits should be used fairly wide. Hence a long collimator such as described and a good dispersion will be necessary to obtain the best definition of the sun's image.—*April 30.*

p. 363, with certain slight modifications suggested by their experience on that occasion. Two sets of observations were made: the first with a photometer equatorially mounted, and designed to measure the comparative brightness of the corona at different distances from the moon's limb, and the second with an instrument arranged to measure the total brightness of the corona, excluding as far as possible the sky effect. In both cases the principle of photometry was that of Bunsen, the intensity of the coronal light being compared with that of a standard glow-lamp, according to the method of Abney and Festing.

The measurements with the equatorial photometer were made by Dr. Thorpe, assisted by Mr. P. L. Gray, B.Sc., those with the second or integrating instrument were made by Mr. Jas. Forbes, jun., assisted by Mr. Willoughby, of H.M.S. "Alecto."

The mean of ten concordant readings with the integrating photometer reduced to values of light intensity and expressed in Siemens' units was 0·026.

The measurements with the equatorial photometer show that the visual brightness of the corona of the 1893 eclipse varied within comparatively wide limits, and that, at all events close to the moon's limb, there was marked variation in local intensity. If the several values taken in the direction of the poles and equator are grouped as in the former paper (*loc. cit.*), they are found to afford a curve almost identical in character with that already given, showing that the diminution in intensity from the moon's limb outwards is less rapid than accords with the law of inverse squares.

The results are as follows :—

Distances in solar semi-diameters.	Photometric Intensity.		
	Observed.		Law of inverse squares.
	1893.	1886.	
1·6	0·060	0·066	0·066
2·0	0·048	0·053	0·042
2·4	0·038	0·043	0·029
2·8	0·030	0·034	0·022
3·2	0·024	0·026	0·016
3·4	0·018	0·021	0·013

These numbers would appear to show that the actual brightness of the corona was probably not very dissimilar at the two eclipses, the slight apparent diminution observed during the 1893 eclipse being,

in all probability, due to the haze, or opalescence, in the air which prevailed at the time. This haze, caused more by suspended and finely divided solid matter than by precipitated moisture, undoubtedly contributed to the general sky-illumination at the time of totality. The actual gloom during this phase of the eclipse at Fundium was certainly much less than at Grenada in 1886. It must not be forgotten, however, that the altitude of the sun was very different on the two occasions. At Grenada it was only about 19° : the amount of cloud was from seven to eight (overcast = 10) at the time of totality, and much of the cloud was in the neighbourhood of the sun: whereas at Fundium the sun's altitude was 52° , and the sky was of a bluish-grey colour and practically free from cloud.

The effect of these different conditions in the sky in the neighbourhood of the disc is seen in Mr. Forbes' measurements when compared with those of Lieutenant Douglas, at Grenada. The ten fairly concordant observations at Fundium give, as already stated, an average value of 0.026 Siemens units at 1 ft. from the screen; and the value observed by Lieutenant Douglas, 15 seconds after totality, with the same photometer, although with a different lamp and galvanometer, was 0.0197 light units.

“The Total Eclipse of the Sun, April 16, 1893. Report and Discussion of the Observations relating to Solar Physics.”

By J. NORMAN LOCKYER, C.B., F.R.S. Received April 17,
—Read April 30, 1896.

(Abstract.)

The memoir first gives reports by Mr. Fowler and Mr. Shackleton as to the circumstances under which photographs of the spectra of the eclipsed sun were taken with prismatic cameras in West Africa and Brazil respectively on April 16, 1893. These are followed by a detailed description of the phenomena recorded, and a discussion of the method employed in dealing with the photographs. The coronal spectrum and the question of its possible variation, and the wavelengths of the lines recorded in the spectra of the chromosphere and prominences, are next studied.

Finally, the loci of absorption in the sun's atmosphere are considered.

The inquiry into the chemical origins of the chromospheric and prominence lines is reserved for a subsequent memoir.

The general conclusions which have been arrived at are as follows:—

(1) With the prismatic camera, photographs may be obtained with